

Notice of Allowability

Application No.

10/629,884

Examiner

Kevin M. Bernatz

Applicant(s)

GILL, HARDAYAL SINGH

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to interview on 8/17/05.
2. ☒ The allowed claim(s) is/are 1-13, 15-26 and 28-41.
3. ☒ The drawings filed on 29 July 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 08192005.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with Mr. David Lynch on August 10, 2005.

The application has been amended as follows:

- Claim 1, lines 3 - 4: the phrase "adjust one or more properties of the tunnel junction device" was replaced with "reduce a series resistance of a barrier layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer";
 - Claim 1, line 5: before "disposed", the following phrase was inserted:
"comprising oxygen and initially none of the diffusion components";
 - Claim 1, lines 5 – 10: the phrase "comprising diffusion components ... of the tunnel junction device" was replaced with the phrase: ", wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer";
- Claim 17, lines 4 - 5: the phrase "adjust one or more properties of the tunnel junction device" was replaced with "reduce a series resistance of a barrier

layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;

- Claim 17, line 6: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”;
 - Claim 17, lines 6 – 12: the phrase “the barrier layer comprising diffusion components ... of the tunnel junction device” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”;
- Claim 30, lines 6 - 7: the phrase “adjust one or more properties of the tunnel junction sensor” was replaced with “reduce a series resistance of a barrier layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;
 - Claim 30, line 8: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”;
 - Claim 30, lines 8 – 14: the phrase “the barrier layer including diffusion components ... of the tunnel junction device” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”;
- Claim 38, lines 5 - 6: the phrase “adjust one or more properties of the memory element” was replaced with “reduce a series resistance of a barrier layer,

decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;

- Claim 38, line 7: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”;
- Claim 38, lines 7 – 13: the phrase “the barrier layer comprising diffusion components ... of the tunnel junction device” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”;
- Claim 39, line 3: the phrase “adjust one or more properties of the tunnel junction device” was replaced with “reduce a series resistance of a barrier layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;
 - Claim 39, line 5: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”;
 - Claim 39, lines 6 – 11: the phrase “the tunnel barrier layer including diffusion components ... of the tunnel junction device” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”;
- Claim 40, line 3: the phrase “adjust one or more properties of the tunnel junction sensor” was replaced with “reduce a series resistance of a barrier

layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;

- Claim 40, line 5: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”;
- Claim 40, lines 5 – 11: the phrase “the barrier layer comprising diffusion components ... of the tunnel junction device” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”;
- Claim 41, line 5: the phrase “alter one or more properties of the sensing means” was replaced with “reduce a series resistance of a barrier layer, decrease a bandgap of a barrier layer, and/or passivate an interface of a barrier layer”;
 - Claim 41, line 7: before “between”, the following phrase was inserted:
“comprising oxygen and initially none of the diffusion components”; and
 - Claim 41, lines 8 – 13: the phrase “the barrier layer including diffusion components ... adjusting the one or more properties” was replaced with the phrase: “wherein after deposition of the barrier layer, a portion of the diffusion components are migrated from the at least one of the first and the second magnetic layers to the barrier layer”.

Reasons for Allowance

3. The present claims are deemed allowable over the references of record since the references of record fail to disclose or render obvious the recited structure regarding the barrier layer and the diffusion components.

The prior art of record includes many similar structures, but fails to teach a non-oxide diffusion component, which effects the element/sensor per the claimed limitations as well as being a component that is initially in an adjacent ferromagnetic layer and subsequently diffuses into the barrier layer. Specifically, the prior art of record (including the references noted below) teach ferromagnetic (FM) oxides annealed to diffuse oxygen into an adjacent metal layer to form an oxide barrier layer; FM+ element X adjacent to an oxide layer and annealed to diffuse oxygen from the barrier layer into the FM layer; FM + element X adjacent to an oxide layer and annealed to diffuse oxides of element X to the *interface* of the barrier layer, but not into the barrier layer; and contamination of an oxide barrier layer by Mn migration from an antiferromagnetic layer, through a FM layer and into a barrier layer upon annealing for other intentions. In the latter case, the Examiner notes that the Mn migration into the barrier layer *negatively* impacts the properties of the tunnel junction and is not deemed to read on the Markush listing of beneficial property adjustments recited in the claimed invention.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner's Comments

5. In order to better clarify the record, the examiner wishes to point out the following references: Lee et al. (U.S. Patent No. 5,712,612) teach annealing a FM-oxide layer next to an aluminum layer to form an aluminum oxide barrier layer; Matsukawa et al. (U.S. Patent App. No. 2004/0027733 A1) teach diffusing elements from a FM layer to the interface of a barrier layer, but not into the barrier layer; and Amano et al. (U.S. Patent App. No. 2004/0240123 A1) teach that it is known in the art that annealing for various reasons can result in barrier layer contamination by Mn from the antiferromagnetic layers in the sensor/element.

Conclusion

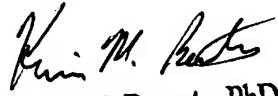
6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
August 16, 2005


Kevin M. Bernatz, PhD
Primary Examiner